PROCEEDINGS
SAICSIT'95
RESEARCH & DEVELOPMENT SYMPOSIUM
INDUSTRY MEETS ACADEMIA
25 & 26 MAY 1995
DISCIPLINES
- COMPUTER SCIENCE
- SOFTWARE ENGINEERING
- INFORMATION SYSTEMS
A. L. STEENKAMP (RED.)
Papers delivered at the

SAICSIT • 95

Research & Development Symposium

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♦ Computer Society of South Africa and the

♦ University of South Africa

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PREFACE

On the occasion of the first symposium of the South African Institute for Computer Scientists and Information Technologists I wish to welcome everyone to this forum for the exchange of ideas and results on research and development in the disciplines of Computer Science, Software Engineering and Information Systems. The growing demand for information and computer systems of ever-increasing size, scope and complexity has emphasized the need for approaches which acknowledge the interrelationships between the various technology strands in the field of information technology. The three disciplines of this symposium reflect the broader interests of the membership of our restructured institute. It has been a pleasure to participate in the organisation of this event that has attracted such a number of fine contributions. I wish to acknowledge and thank all the members of the organising and programme committees who contributed their efforts to make the symposium the success that we aimed for. A special word of thanks to Persetel and Siemens for providing financial support, to the University of South Africa for making its services and venues available, and to the administration of the Computer Society of South Africa for their assistance. We are also indebted to the Department of Computer Science and Information Systems of UNISA who made the resources and infrastructure of the Centre for Software Engineering available to organise the symposium. Special mention is due to our efficient secretary El-marie Botha who devoted so much effort to the administration of the symposium and preparation of the proceedings.

Prof A L Steenkamp
President: SAICSIT
WELCOMING MESSAGE

It is a pleasure to welcome the participants of the first symposium of the South African Institute for Computer Scientists and Information Technologists at the University of South Africa.

Recent developments in computers and information technology have opened new and exciting possibilities for mankind. These developments have irrevocably turned concepts which we thought that we understand into problems, for instance:

- the concept Wealth of Nations does not depend anymore on visible products produced in visible factories, but on the invisible flow of information and services along invisible lines of communication which are managed by virtually invisible machines, using invisible software;

- the concept of the mega-organisation, (like mega states, mega-churches, mega-universities, mega-businesses) with its central control and mega-burocracy, is being replaced by the concept of small-is-also-powerful - "organisations" run by individuals all around the globe linked up in virtual structures and are eliminating the powers of states, councils and boards; and

- some of our concepts about education and training of two millenia, are suddenly being replaced by new ones depending upon telematics and information technology, which leaves the traditional educationalist in a state of bewilderment and indecision.

These are important problem areas to be studied - and UNISA has an interest in the solutions to all of them - especially in the problem area of education-over-a-distance, since we are moving towards the implementation of the new technologies to serve our students better.

I am pleased to see that some of the speakers of the symposium are addressing these and other areas of interest, and I express the hope that your deliberations will contribute to their solution.

Prof C J H Schutte
Chief Executive Director:
Science, Technology & Informatics, UNISA
OPENING MESSAGE

Information Technology and the undergirding computer sciences will have a profound impact on the reconstruction and development of South Africa. This is however not simply a national or regional concern. In order to become a competitive economy, the deployment of a national information technology infrastructure and the effective and judicious use of these resources will be critical.

Trained human resources will be required. There is, more importantly, a need to develop an understanding of how information technology can redress and overcome the educational and development deficits which result from our past.

Research in this critical field cannot therefore take place in a vacuum without being informed of our context. I have initiated a process to develop a Science and Technology White Paper which will, among other things, address information technology and its impact on the endeavours of science and technology and, more pervasively, on the competitiveness and development needs of the nation.

The SAICSIT will I hope, with other specialist institutes and role players, contribute to the direction setting envisaged in the White Paper and develop a rich texture of responses that will enhance our national information technology endeavours. I wish you well for this important symposium.

Dr B Ngubane
Minister of Arts, Culture, Science and Technology
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SYMPOSIUM PROCEEDINGS

Copies of the proceedings will be handed out at the symposium. Delegates who attend the symposium will receive a copy of the proceedings free of charge. Additional copies will be sold at R100.00 each. An order form for the symposium proceedings is in the folder handed to you at registration.
Abstract: Tabular notations were developed by D L Parnas and his co-workers for the formal documentation, inspection and validation of large software systems. Such notations provide a formalism which combines mathematical precision with ease of use. This formalism has, on the one hand, important practical applications in software engineering. On the other hand, investigation of it leads to interesting problems in theoretical computer science.
Rank-One Update of Cholesky Factorization*

Ntšibane Ntlatlapa†

February 14, 1995

Abstract

Symmetric positive definite matrices appear in most methods for Unconstrained Optimization. The method widely adopted for factoring these matrices is Cholesky Factorization. Furthermore, in Quasi-Newton methods for unconstrained optimization these matrices are continually updated and factorized.

Here we consider factoring an $n \times n$ symmetric positive definite matrix of the form:

$$A' = A + \alpha zz^T,$$

where $A$ is symmetric positive definite, $\alpha$ is a scalar and $z$ is a vector of length $n$. We assume that $A$ has already been factorized by Cholesky factorization.

The adopted methods are due to Gill et. al. [GGS75, GM72].

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*This an abstraction of the thesis submitted to the School of Information Systems of the University of East Anglia in partial fulfillment of the requirements for the degree of Master of Science in Computer Science by the N. Ntlatlapa on the 30th of September, 1994 [Ntl94] under the supervision of Dr. G.P. McKeown

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References

